

AMSAT News Service Weekly Bulletins

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AMSAT NEWS SERVICE

ANS-141

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The AMSAT News Service bulletins are a free, weekly news and information service of AMSAT, The Radio Amateur Satellite Corporation. ANS publishes news related to Amateur Radio in Space including reports on the activities of a worldwide group of Amateur Radio operators who share an active interest in designing, building, launching and communicating through analog and digital Amateur Radio satellites.

The news feed on <http://www.amsat.org> publishes news of Amateur Radio in Space as soon as our volunteers can post it.

Please send any amateur satellite news or reports to: [ans-editor \[at\] amsat \[dot\] org](mailto:ans-editor@amsat.org).

You can sign up for free e-mail delivery of the AMSAT News Service Bulletins via the ANS List; to join this list see: <https://mailman.amsat.org/postorius/lists/ans.amsat.org/>

ANS-141 AMSAT News Service Weekly Bulletins

To: All RADIO AMATEURS

From: Radio Amateur Satellite Corporation

712 H Street NE, Suite 1653

Washington, DC 20002

DATE 2023 May 21

Eleven U.S. Schools Moved Forward in ARISS Selection Process

Amateur Radio on the International Space Station (ARISS) is pleased to announce the schools/host organizations selected for the January-June 2024 window. A total 11 of the submitted ARISS Education Proposals during the recent proposal window have been accepted to move forward in the processes of planning to host a scheduled amateur radio contact with crew on the ISS. The primary goal of the ARISS program is to engage young people in Science, Technology, Engineering, Arts and Math (STEAM) activities and raise their awareness of space communications, radio communications, space exploration, and related areas of study and career possibilities.

The ARISS program anticipates that NASA will be able to provide scheduling opportunities for these US host organizations. They are now at work completing an acceptable equipment plan that demonstrates their ability to execute the ham radio contact. Once their equipment plan is approved by the ARISS operations team, the final selected schools/organizations will be scheduled as their availability and flexibility match up with the scheduling opportunities offered by NASA in January through June 2024.

The schools and host organizations are:

Belmont Elementary School

Woodbridge, Virginia

Mountain View Elementary
Embry-Riddle Aeronautical University
Lilburn Elementary School
Tooele County School District
Alabama School of Cyber Technology and Engineering
Thrive Home School Academy
Pleasant Knoll Middle School
Centennial Campus Magnet Middle School Center for Innovation
Washington State Science and Engineering Fair
Girl Scout Troop 1089

Marietta, Georgia
Daytona Beach, Florida
Lilburn, Georgia
Tooele, Utah
Huntsville, Alabama
Colorado Springs, Colorado
Ft. Mill, South Carolina
Raleigh, North Carolina
Bremerton, Washington
Sacramento, California

[ANS thanks Dave Jordan, AA4KN for the above information.]

Tevel Satellites Added to ARRL Logbook of the World

The American Radio Relay League (ARRL), "The National Association for Amateur Radio," has recently added the Tevel satellites, numbers one through eight, to the list of acceptable satellites in its widely used Logbook of the World (LoTW) online system. Those who have made contacts using these satellites may now upload those QSOs to LoTW for possible confirmation, if the other station has done likewise.

It will be necessary to first update the TQSL configuration file, following the prompt when that program is opened. The current list of accepted satellites for LoTW may always be found in the LoTW help pages at: <https://lotw.arrl.org/lotw-help/frequently-asked-questions/#sats>

Most published identification for the Tevel satellites, including many distributions of Keplerian elements, show these satellites as Tevel-1, Tevel-2, etc. Unfortunately, LoTW will only accept the names of the satellites in all upper case and without the hyphen: TEVEL1, TEVEL2, etc.

If using a log program that copies the satellite name directly from a tracking program, such as SatPC32, the logged satellite name may not match what LoTW is expecting, resulting in an error or rejected upload.

SatPC32 has a provision for correcting this issue. SatPC32 users may edit the AmsatNames.txt file in order to translate the satellite name from that in the Keplerian elements file to a name compatible with LoTW. By clicking on the ? on the top line of the SatPC32 window, and selecting "Auxiliary Files" from the pull down menu, the user may select AmsatNames.txt and the file will open for editing.

Being careful to follow the directions at the top of the text file, the following lines can be added to AmsatName.txt in order to effect the translation:

```
51013 22002AF  TEVEL1
51069 22002CP  TEVEL2
50988 22002E   TEVEL3
51063 22002CH  TEVEL4
50998 22002Q   TEVEL5
50999 22002R   TEVEL6
51062 22002CG  TEVEL7
50989 22002F   TEVEL8
```

Once added, the file must be saved (Ctrl-S) before being closed. Using the same ? and Auxiliary Files pull down, the satellite names in the Doppler.SQF file should also be changed to upper case without hyphens, and the file saved.

When the SatPC32 program is restarted, the satellites previously named Tevel-1, Tevel-2, and following, will appear as TEVEL1, TEVEL2, and following, in the satellite list. It will then be necessary to open the SatPC32 Satellite menu and delete the lower case names from the list of selected active satellites, and to then re-select the new, upper case names from the left column of available satellites.

While an inconvenient chore in the short term, once these changes have been made to SatPC32, any log program that copies the satellite name directly from the tracking program will automatically record the correct name for upload to LoTW. This will make use of Logbook of the World very efficient for all future contacts with the Tevel satellites.

The same feature can be utilized for other satellites that may have different designations, such as some of the CAS satellites that go by several names.

[ANS thanks Mark Johns, K0JM, for the above information]

SpaceX Ax-2 Mission Is 'Go' For May 21 Launch

The second-ever private astronaut mission to the International Space Station (ISS) remains on track to lift off this weekend. The crew includes three licensed amateurs: John Shoffner, K04MJC; Ali Alqarni, 7Z1AJ; and Rayyanah Barnawi, 7Z1RB.

If all goes according to plan, Ax-2 will launch atop a SpaceX Falcon 9 rocket at 21:37 UTC on Sunday from NASA's Kennedy Space Center (KSC) in Florida. The Ax-2 astronauts will ride a SpaceX Dragon capsule to the orbiting lab, getting there around 13:30 UTC on Monday, May 21.

The mission will spend eight days docked to the ISS. That's a slight change from the previous plan, which had called for a 10-day ISS stay. During their stay, the amateurs on the AX-2 crew will attempt several ARISS contacts, and may possibly offer opportunities for general amateur QSOs with the ISS.

As its name suggests, Ax-2 will be the second crewed flight to the ISS operated by Axiom Space using SpaceX hardware. The first, Ax-1, sent four people to the orbiting lab for more than two weeks in April 2022. That crew was quite active on amateur radio during their stay on the ISS.

Ax-2 is also groundbreaking. Two of the mission's crewmembers, Barnawi and AlQarni, will become the first Saudi Arabians to visit to the ISS. Barnawi will be the first Saudi woman ever to reach space.

The other crewmember is former NASA astronaut Peggy Whitson, who now works for Axiom and will command the mission. Whitson has racked up a total of 665 days off Earth – more than any other American and any other woman. NASA currently requires that all private astronaut flights to the ISS be led by a former agency astronaut.

[ANS thanks Space.com and ARISS for the above information]

2023 AMSAT Board of Directors Election - Call for Nominations

AMSAT solicits nominations for the 2023 AMSAT Board of Directors election, to be held in the third quarter of the year. The seats of the following four incumbent Directors expire in 2023 and will be filled by this year's election:

- Jerry Buxton, N0JY
- Joesph Armbruster, KJ4JIO
- Robert Bankston, KE4AL
- Zach Metzinger, N0ZGO

Further, up to two Alternate Directors may be elected for one-year terms. A valid nomination for Director must be written and requires either one Member Society or five current individual members in good standing to nominate an AMSAT member. Written nominations, with the nominee's name, call sign, and contact information, as well as the nominators' names, call signs, and contact information, should be sent to the AMSAT Secretary:

Jeff Davis, KE9V
PO Box 11
Yorktown, IN 47396

AMSAT bylaws require that the nomination be written and in the form specified by the Secretary who has elected to accept written nomination materials via mail or in electronic form, including email or electronic image of a paper document. Fax transmissions cannot be accepted.

Email nominations may be sent to [jdavis\(a\)amsat.org](mailto:jdavis(a)amsat.org).

[ANS thanks Jeff Davis, KE9V, AMSAT Secretary for the above information.]

<https://www.amsat.org/join-the-amsat-presidents-club/>

reply to the Field Day Greetings addressed to ALL.

The following uploads and downloads count as three-point digital contacts.

- (a) Upload of a satellite Field Day Greetings file (one per satellite).
- (b) Download of Satellite Field Day Greetings files posted by other stations. Downloads of non-Field Day files or messages not addressed to ALL are not to be counted for the event. Save DIR listings and message files for later "proof of contact."

You may make contacts with GreenCube, IO-117 and each one will count as 3 points as do other digital contacts.

Please note AMSAT uploaded messages do not count for QSO points under the ARRL rules.

Sample Satellite Field Day Greetings File:

Greetings from W5MSQ Field Day Satellite station near Katy, Texas, EL-29, with 20 participants, operating class 2A, in the AMSAT-Houston group with the Houston Amateur Television Society and the Houston QRP club. All the best and 73!

Note that the message stated the call, name of the group, operating class, where they were located (the grid square would be helpful) and how many operators were in attendance.

3. Operating Class

Stations operating portable and using emergency power (as per ARRL Field Day rules) are in a separate operating class from those at home connected to commercial power. On the report form simply check off Emergency or Commercial for the Power Source and be sure to specify your ARRL operating class (2A, 1C, etc.).

And Finally...

The Satellite Summary Sheet should be used for submission of the AMSAT Field Day competition and be received by KK5DO (e-mail) by 11:59 P.M. CDT, Tuesday, July 25, 2023. This year, we are using the same due date as the ARRL. The only method for submitting your log is via e-mail to [kk5do\(a\)amsat.org](mailto:kk5do(a)amsat.org) or [kk5do\(a\)arrl.net](mailto:kk5do(a)arrl.net). I have not had a mail-in entry in over 6 years, probably even longer than that.

Add photographs or other interesting information that can be used in an article for the Journal.

You will receive an e-mail back (within one or two days) from me when I receive your e-mail submission. If you do not receive a confirmation message, then I have not received your submission. Try sending it again or send it to my other e-mail address.

Certificates will be awarded for the first-place emergency power/portable station at the AMSAT General Meeting and Space Symposium in the fall of 2023. Certificates will also be awarded to the second and third place portable/emergency operation in addition to the first-place home station running on emergency power. A station submitting high, award-winning scores will be requested to send in dupe sheets for analog contacts and message listings for digital downloads.

You may have multiple rig difficulties, antenna failures, computer glitches, generator disasters, tropical storms, and there may even be satellite problems, but the goal is to test your ability to operate in an emergency situation. Try different gear. Demonstrate satellite operations to hams that don't even know the HAMSATS exist. Test your equipment. Avoid making more than ONE contact via the FM-only voice HAMSATS or the ISS, and enjoy the event!

[ANS thanks Bruce Paige, KK5DO, AMSAT Director, for the above information.]

2023 Field Day - More Thoughts

It's that time of year again; summer and Field Day! Each year the American Radio Relay League (ARRL) sponsors Field Day as a "picnic, a campout, practice for emergencies, an informal contest and, most of all, FUN!" The event takes place during a 23-hour period on the fourth weekend of June. For 2023 the

event takes place during a 27-hour period from 1800 UTC on Saturday June 24, 2023 through 2100 UTC on Sunday June 25, 2023. Those who set up prior to 1800 UTC on June 24 can operate only 24 hours. The Radio Amateur Satellite Corporation (AMSAT) promotes its own version of Field Day for operation via the amateur satellites, held concurrently with the ARRL event.

This year should be as easy as last year since we have more than 10 transponders and repeaters available. Users should check the AMSAT status page at <http://www.amsat.org/status/> and the pages at <https://www.amsat.org/two-way-satellites/> for what is available in the weeks leading up to Field Day. To reduce the amount of time to research each satellite, see the current FM satellite table at <https://www.amsat.org/fm-satellite-frequency-summary/> and the current linear satellite table at <https://www.amsat.org/linear-satellite-frequency-summary/>

If you are considering ONLY the FM voice satellites, there are ISS, S0-50, A0-91, P0-101 and possibly LilacSat. It might be easier this year to make that one FM contact for the ARRL bonus points with so many FM birds. The congestion on FM LEO satellites is always so intense that we must continue to limit their use to one-QSO-per-FM-satellite. This includes the International Space Station. You will be allowed one QSO if the ISS is operating Voice.

It was suggested during past field days that a control station be allowed to coordinate contacts on the FM satellites. There is nothing in the rules that would prohibit this. This is nothing more than a single station working multiple QSO's. If a station were to act as a control station and give QSO's to every other field day station, the control station would still only be allowed to turn in one QSO per FM satellite while the other station would be able to submit one QSO.

The format for the message exchange on the ISS or other digital packet satellite is an unproto packet to the other station (3-way exchange required) with all the same information as normally exchanged for ARRL Field Day, e.g.:

```
W6NWG de KK5DO 2A STX
KK5DO de W6NWG QSL 5A SDG
W6NWG de KK5DO QSL
```

If you have worked the satellites on Field Day in recent years, you may have noticed a lot of good contacts can be made on some of the less-populated, low-earth-orbit satellites like F0-29, A0-7, E0-88 or the XW satellites. During Field Day the transponders come alive like 20 meters on a weekend. The good news is that the transponders on these satellites will support multiple simultaneous contacts. The bad news is that you can't use FM, just low duty-cycle modes like SSB and CW.

[ANS thanks Bruce Paige, KK5DO, AMSAT Director, for the above information.]

How Moon-based Telescopes Could Revolutionize Astronomy

The exploration of the Moon is experiencing a renaissance with numerous missions planned to visit the lunar surface in the coming years. While there are various motivations for these missions, such as geopolitical interests and the search for lunar resources, the field of astronomy is expected to greatly benefit from this renewed focus on the Moon. One significant advantage is the lunar far side, which provides a radio-quiet environment, shielded from human-generated radio signals and solar interference. This makes it an ideal location for radio astronomy, especially for studying the cosmic "dark ages" and the structure of the early universe. The Moon's stability and the presence of shadowed craters at its poles offer opportunities for optical, infrared, and gravitational wave astronomy, as well as the potential detection of radio waves from exoplanet magnetospheres. However, there is a need to balance lunar exploration activities with protecting the unique scientific value of certain lunar locations.

The far side of the Moon, shielded from Earth's radio signals and the Sun during the lunar night, provides an unparalleled radio-quiet environment. This makes it an ideal platform for conducting low-frequency radio astronomy, enabling the study of the cosmic "dark ages" and the early universe's hydrogen clouds. The 21cm wavelength emissions from neutral hydrogen in the early universe, shifted to longer wavelengths due to the universe's expansion, can be studied from the lunar far side, offering insights into the universe's early stages.

The far side of the Moon also holds potential for detecting radio waves from exoplanet magnetospheres and signals from intelligent extraterrestrial civilizations. The long wavelengths of these radio waves require a radio-quiet environment, making the far side an ideal location for such observations. Furthermore, exploring unexplored regions of the radio spectrum may lead to unexpected discoveries of new phenomena. However, it is crucial to ensure that human activities on the far side do not create unwanted radio interference that could hinder these observations and scientific endeavors.

Apart from radio astronomy, the Moon's unique characteristics and stable environment also offer advantages for other types of astronomy. Infrared telescopes, which are sensitive to heat, can benefit from the cold, shadowed craters at the lunar poles that provide natural shielding. The low gravity on the Moon allows for the construction of larger telescopes than what is feasible in free space. This could make the Moon the future hub for infrared astronomy. Additionally, the lunar surface, bombarded by solar wind and cosmic rays for billions of years, holds a wealth of information about the Sun and the Milky Way's evolution.

While the current era of lunar exploration promises significant advancements in astronomy, there is a need to protect lunar locations that are uniquely valuable for scientific research. Human activities and plans for resource extraction, such as water-ice from shadowed craters, must be carefully managed to minimize interference with astronomical observations. Preserving the pristine environment of the lunar far side and other scientifically important regions will be crucial to ensure the long-term benefits of lunar exploration for astronomy.

[ANS thanks Ian Crawford, Professor of Planetary Science and Astrobiology, Birkbeck, University of London for the above information]

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Need new satellite antennas? Purchase Arrows, Alaskan Arrows, and M2 LEO-Packs from the AMSAT Store. When you purchase through AMSAT, a portion of the proceeds goes towards Keeping Amateur Radio in Space.
<https://amsat.org/product-category/hardware/>

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ARISS NEWS

Amateurs and others around the world may listen in on contacts between amateurs operating in schools and allowing students to interact with astronauts and cosmonauts aboard the International Space Station. The downlink frequency on which to listen is 145.800 MHz worldwide.

+ Upcoming Contacts

Saudi Space Commission (SSC), Riyadh, Saudi Arabia, direct via HZ1SAR

The ISS callsign is presently scheduled to be HZØISS

The scheduled crewmember is John Shoffner, Ali Alqarni 7Z1AJ, or Rayyanah Barnawi 7Z1RB

The ARISS mentor is IZ2G0J

Contact is go only if AX2 launches 2023-05-21 for: Wed 2023-05-24 11:08:38 UTC 23 deg

Middlesboro School System, Middlesboro, KY, telebridge via IK1SLD

The ISS callsign is presently scheduled to be OR4ISS

The scheduled crewmember is John Shoffner K04MJC

The ARISS mentor is AA6TB

Contact is go only if AX2 launches 2023-05-21 for: Thu 2023-05-25 15:07:12 UTC 33 deg

St. Francis Xavier High School, Gloucester, ON, Canada, telebridge via VK4ISS

The ISS callsign is presently scheduled to be NA1SS

The scheduled crewmember is Warren Hoburg KB3HTZ

The ARISS mentor is VE3TBD

Contact is go for: Fri 2023-05-26 16:32:49 UTC 25 deg

The Children's Inn at NIH (National Institutes of Health), Bethesda, Maryland, telebridge via ON4ISS

The ISS callsign is presently scheduled to be 0R4ISS

The scheduled crewmember is John Shoffner K04MJC

The ARISS mentor is W8AAS

Contact is go only if AX2 launches 2023-05-21 for: Fri 2023-05-26 17:31:38 UTC 90 deg

Saint Petersburg, Russia, direct via TBD
The ISS callsign is presently scheduled to be RSØISS
The scheduled crewmember is Andrey Fediaev
The ARISS mentor is RV3DR
Contact is go for Sat 2023-05-27 16:50 UTC

Muslyumovo, Tatarstan, Russia, direct via TBD
The ISS callsign is presently scheduled to be RSØISS
The scheduled crewmember is Dmitry Petelin
The ARISS mentor is RV3DR
Contact is go for Sun 2023-05-28 14:25 UTC

Amur State University, Blagoveshchensk, Russia, direct via TBD
The ISS callsign is presently scheduled to be RSØISS
The scheduled crewmember is Dmitry Petelin
The ARISS mentor is RV3DR
Contact is go for Thu 2023-06-01 08:10 UTC

The latest information on the operation mode can be found at
<https://www.ariss.org/current-status-of-iss-stations.html>

The latest list of frequencies in use can be found at <https://www.ariss.org/contact-the-iss.html>

[ANS thanks Charlie Sufana, AJ9N, one of the ARISS operation team mentors for the above information.]

Upcoming Satellite Operations

K5ZM: From 14th through part of 21st May, I'll be in RDU where I'll be based in FM05. Then on the 21st, I fly into PWM and after a short road trip, I'll be in FN54 through the 26th. In each location, the usual scenario will apply: emphasis will be on grid lines whenever possible. I would love to do the 56/66/57/67 confluence but I'm not sure how much time I'm willing to invest in locating the owner of that field! Pass list(s) are under development. Watch Twitter and hams.at for the minutia.

Ray, KN2K, will be active in FM08, May 21 and 22. Details at hams.at and on Twitter.

>From Mike, N8MR: I will be in EN84, EN85 and EN76 from Friday, May 26 thru Monday, May 29. Using an Icom 9700, Arrow antenna and SAT controller. Listening for Europe for eastern passes. All QSOs going to LoTW as N8MR.

[ANS thanks Ian Parsons, K5ZM, AMSAT rover page manager, for the above information]

Hamfests, Conventions, Maker Faires, and Other Events

AMSAT Ambassadors provide presentations, demonstrate communicating through amateur satellites, and host information tables at club meetings, hamfests, conventions, maker faires, and other events.

+ AMSAT Symposium and Annual Meeting
October 20-21, 2013
Dallas, Texas

AMSAT Ambassadors provide presentations, demonstrate communicating through amateur satellites, and host information tables at club meetings, hamfests, conventions, maker faires, and other events.

AMSAT Ambassador Clint Bradford, K6LCS, says,

Wonderful clubs in Florida and Southern CA heard our "Work the Easy Satellites" presentation this week. I swapped date for the England club with another speaker/topic - we are re-scheduling to the Summer. Upcoming dates for Escondido CA, Daytona FL, Sevierville TN, and Baraboo WI are being confirmed.

Clint Bradford K6LCS
work-sat.com
951-533-4984

"Think a 75-minute presentation on "working the easy satellites" would be appropriate for your club or event? Let me know by emailing me at k6lcsclint (at) gmail (dot) com or calling me at 909-999-SATS (7287)!"

[ANS thanks Ian Parsons, K5ZM, AMSAT rover page manager, for the above information]

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Want to fly the colors on your own grid expedition?
Get your AMSAT car flag and other neat stuff
from our Zazzle store!
25% of the purchase price of each product goes
towards Keeping Amateur Radio in Space
https://www.zazzle.com/amsat_gear

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Satellite Shorts From All Over

+ AMSAT News Service welcomes its newest weekly editor, Mitch Ahrenstorff, AD0HJ. Mitch is a Life Member of AMSAT who has confirmed over five thousand contacts via satellite, activated eighty seven Maidenhead grid squares, and completed his AMSAT GridMaster Award in 2022. News tips can be forwarded to Mitch, and to all ANS editors, at [ans-editor \[at\] amsat \[dot\] org](mailto:ans-editor[at]amsat[dot]org). (ANS thanks Mark Johns, K0JM, Senior Editor, for the above information)

+The Providence Radio Association, W10P will attempt SSB and FM satellites QSO's from the Alan S. Feinstein Middle School, in Coventry, RI on Tuesday May 23rd. This will be part of a presentation on ham radio to about 350 students in their 8th grade STEM program. N1DM will be the operator and will attempt to work any available satellites during the demo portion of the program which will occur somewhere in the period of 1300 to 1500 UTC. W10P/N1DM requests if you make a QSO in addition to call and grid square you give your STATE or PROVINCE. (ANS thanks Dom Mallozzi, N1DM for the above information.)

+ China's secretive spaceplane may have performed multiple recaptures of an object it released into orbit during its recently completed second flight as part of on-orbit testing. Private firm Leolabs, which provides space situational awareness data through its global network of radars for tracking objects in low Earth orbit, said its analysis found evidence of what appeared to be at least two and possibly three capture/docking operations with a co-orbiting object. (ANS thanks SpaceNews for the above information)

+ Around 7,000 satellites circle the Earth, generating a massive volume of data on a daily basis. This wealth of information, operated by various governments and commercial entities, can prove challenging for researchers looking to fully harness the potential of these orbital sensors. Researchers at Stevens Institute of Technology have introduced a digital platform named the New Observing Strategies Testbed (NOS-T), a tool that facilitates the exchange of limited, approved data messages, ensuring data sharing without revealing sensitive information, control algorithms, or proprietary technologies. Leveraging multiple satellites enables continuous monitoring of specific locations, which can be applied to tasks such as wildfire detection and landslide prediction. (ANS thanks SpaceDaily for the above information)

+ SpaceX's launch of 51 more Starlink internet satellites Wednesday, May 10 from California marked the 200th consecutive successful mission for the company's Falcon rocket family, a record unmatched by any other space launch vehicle. (ANS thanks SpaceFlight Now for the above information)

+ China's Tianzhou 6 cargo ship lifted off on a resupply mission to the country's Tiangong space station on May 10 – the first since the station was completed in November. The uncrewed ship – carrying 7.4 tons of fuel, food and other supplies – was launched on top of a Long March 7 rocket from the Wenchang spaceport in southern China's Hainan island, according to the China Manned Space Agency. The upgraded Tianzhou cargo spacecraft has expanded capacity, which means China will need to launch a Tianzhou mission once every eight months, instead of every six months, as previously. (ANS thanks

SpaceNews for the above information)

Join AMSAT today at <https://launch.amsat.org/>

In addition to regular membership, AMSAT offers membership to:

- * Societies (a recognized group, clubs or organization).
- * Primary and secondary school students are eligible for membership at one-half the standard yearly rate.
- * Post-secondary school students enrolled in at least half time status shall be eligible for the student rate for a maximum of 6 post-secondary years in this status.
- * Memberships are available for annual and lifetime terms.

Contact info [at] amsat.org for additional membership information.

73 and remember to help Keep Amateur Radio in Space!

This week's ANS Editor, Mitch Ahrenstorff, AD0HJ
ad0hj [at] amsat [dot] org